

Claims

[c1] Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. A method of segmenting and reconfiguring scan chains to diagnose defects in the scan chains comprising:

partitioning a plurality of serially extending scan chains into a plurality of serially arranged segments, such that each serially extending scan chain comprises a plurality of serially extending segments;

positioning a plurality of switches, having control inputs to control switching of the switches, between the plurality of segments of each scan chain;

controlling the control inputs of the plurality of switches to connect,

each segment of each scan chain except an initial segment to a preceding serial segment in the same scan chain, and each segment of each scan chain except a final segment to a next serial segment in the same scan chain, or

each segment of each scan chain except an initial segment to a preceding serial-adjacent segment in an adjacent scan chain, and each segment of each scan chain

except a final segment to a next serial-adjacent segment in an adjacent scan chain, wherein, depending upon the control inputs to the switches, an output of each scan segment is directed either to a next serial segment in the same scan chain or to a next serial-adjacent segment in an adjacent scan chain, and a preceding serial segment in an adjacent scan chain and the next serial segment in an adjacent scan chain are in different scan chains.

[c2] 2. The method of claim 1, further including: directing scan in data patterns into the plurality of serially extending scan chains; identifying particular defective segments of the plurality of serially extending scan chains by controlling the switches to connect and shift the data pattern out of each segment of a scan chain serially to a next serial segment in the same scan chain, or to connect and shift the data pattern out of each segment of a scan chain to a next serial-adjacent segment in an adjacent scan chain, with a sequence of serial shifts and serial-adjacent shifts being selected to identify particular defective segments of the plurality of serially extending scan chains.

[c3] 3. The method of claim 2, wherein the step of controlling asserts a control input of a first type that connects and shifts the data pattern out of each segment of a scan

chain to a next serial segment in the same scan chain, or a control input of a second type that connects and shifts the data pattern out of each segment of a scan chain to a next serial-adjacent segment in an adjacent scan chain.

- [c4] 4. The method of claim 3, wherein the switches are multiplexors and a single control input controls all of the multiplexors.
- [c5] 5. The method of claim 4, wherein the single control input statically restructures the scan chains prior to directing scan in data patterns into the plurality of serially extending scan chains.
- [c6] 6. The method of claim 1, wherein the step of partitioning partitions all segments in all scan chains to be the same length.
- [c7] 7. The method of claim 1, wherein the step of partitioning partitions all segments in all scan chains to be the same length except initial segments in all scan chains.
- [c8] 8. The method of claim 1, wherein the step of partitioning partitions all segments in all scan chains to be the same length except final segments in all scan chains.
- [c9] 9. The method of claim 4, wherein the single control input dynamically restructures the scan chains while the

data patterns are being clocked through the plurality of dynamically restructured scan chains.

- [c10] 10. The method of claim 9, wherein the single control input dynamically restructures the scan chains to route blocks of data having a uniform length through the dynamically restructured scan chains.
- [c11] 11. The method of claim 9, wherein the single control input dynamically restructures the scan chains to route blocks of data having a uniform length through the dynamically restructured scan chains, except for a non-uniform length initial segment or a non-uniform length final segment.
- [c12] 12. The method of claim 4, wherein the single control input statically restructures the scan chains prior to directing scan in data patterns into the plurality of serially extending scan chains, and also dynamically restructures the scan chains while the data patterns are being clocked through the plurality of dynamically restructured scan chains.
- [c13] 13. The method of claim 12, wherein the single control input dynamically restructures the scan chains to route blocks of data having a uniform length through the dynamically restructured scan chains.

- [c14] 14. The method of claim 12, wherein the single control input dynamically restructures the scan chains to route blocks of data having a uniform length through the dynamically restructured scan chains, except for a non-uniform length initial segment or a non-uniform length final segment.
- [c15] 15. The method of claim 1, wherein the step of partitioning partitions the plurality of scan chains into a plurality of segments wherein the number n of segments in each scan chain is equal to the number n of scan chains.
- [c16] 16. The method of claim 3, wherein in a first test, an input scan in data pattern is introduced into the beginning of each serially extending scan chain, and the switches are controlled by the control input of a first type such that the data patterns are clocked serially through the scan chains, and if all scan chains are perfect with no fails, the scan out data pattern at the end of each scan chain is identical to the input scan in data pattern or to a logical inverse of the input scan in data pattern.
- [c17] 17. The method of claim 16, wherein after the first test, when at least one fail scan chain suffers a fail wherein the scan out data pattern at the end of the fail scan chain is not identical to the input scan in data pattern into the

fail scan chain or to the logical inverse of the input scan in data pattern into the fail scan chain, then the control input is set to the second type such that the scan chains are reconfigured to connect each segment of a scan chain to a next serial-adjacent segment in an adjacent scan chain.